

Redefining Radiology: A Review of Artificial Intelligence Integration in Medical Imaging

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Abstract

This comprehensive review unfolds a detailed narrative of Artificial Intelligence (AI) making its foray into radiology, a move that is catalysing transformational shifts in the healthcare landscape. It traces the evolution of radiology, from the initial discovery of X-rays to the application of machine learning and deep learning in modern medical image analysis. The primary focus of this review is to shed light on AI applications in radiology, elucidating their seminal roles in image segmentation, computer-aided diagnosis, predictive analytics, and workflow optimisation. A spotlight is cast on the profound impact of AI on diagnostic processes, personalised medicine, and clinical workflows, with empirical evidence derived from a series of case studies across multiple medical disciplines. However, the integration of AI in radiology is not devoid of challenges. The review ventures into the labyrinth of obstacles that are inherent to AI-driven radiology—data quality, the 'black box' enigma, infrastructural and technical complexities, as well as ethical implications. Peering into the future, the review contends that the road ahead for AI in radiology is paved with promising opportunities. It advocates for continuous research, embracing avant-garde imaging technologies, and fostering robust collaborations between radiologists and AI developers. The conclusion underlines the role of AI as a catalyst for change in radiology, a stance that is firmly rooted in sustained innovation, dynamic partnerships, and a steadfast commitment to ethical responsibility.